RocketRAID 2322
SATAII Host Adapter
User's Guide

HighPoint

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HighPoint Technologies, Inc.

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Chapter 1
Introduction

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About this Guide

The RocketRAID 2322 SATAII Host Adapter's User's Guide provides information about the functions and capabilities of the host adapter, and instructions for installing, configuring and maintaining RAID arrays hosted by the adapter.

Introducing the RocketRAID 2322 Host Adapter

The HighPoint RocketRAID 2322 is a dual-port external Mini-SAS (Serial Attached SCSI) PCI-Express to Serial ATA II RAID controller. The RocketRAID 2322 solution is aimed at enterprise storage applications, NAS storage, workgroup and web servers, video streaming / video editing workstations, back up, and security systems.

Product Features

- PCI-Express x4 bus compatible to PCI-Express x8 and x16
- Two external Mini-SAS connectors
- Compatible with HighPoint (X4 and X8) external drive enclosures
- 8 External SATA II ports
- Up to 3Gb/s transfer rates
- RAID 0, 1, 5, 10, 50 and JBOD
- Native Command Queuing (NCQ)
- Staggered drive spin-up
- Online Capacity Expansion (OCE) and Online RAID Level Migration (ORLM)
- Hot Swap and Hot Spare
- Quick and Background initialization for quick RAID configuration
- SAF-TE Enclosure management ready
- S.M.A.R.T monitoring hard drive status for reliability
- Hard Drive activity and failed LED support
- Automatic RAID rebuild
- BIOS booting support
- Online array roaming
- Support 64-bit LBA for over 2TB partition
- Browser-based RAID management software
- Command Line Interface (CLI)
- SMTP support for email notification
- Power Mac G5 support
- Operating Systems support for Windows, Linux, FreeBSD and Mac OS X

Physical Specifications:

Size: 4.664"L x 3.349"H (118.47mm x 85.06mm)

EMI & ECC: FCC Part 15 Class B and CE

Thermal and Atmospheric Characteristics:

Working Temperature Range : +5°C ~+ 55°C

Relative Humidity Range : 5% ~ 60% non condensing

Storage Temperature : ~20°C ~ 80°C

MTBF: 920,585 hours

Electrical Characteristics:

PCI-Express: 3.3v

Power: 10W

Understanding RAID Concepts and Terminology

The following concepts and terminology is commonly used when describing the functions of the RocketRAID 2322 Host Adapter.

Disk initialization

Initializing a disk writes necessary RAID configuration information to that disk. Disks must be initialized before configuring them into RAID arrays. The initialization process will destroy all data on the disk.

Disk Status

New	The disk contains no data and has not been initialized.
Initialized	The disk has been initialized and can be used for array creation.
Configured	The disk has been assigned to one or more arrays, or configured as a spare disk.

Legacy The disk was used on other controllers before use with the RocketRAID 2322 (see *legacy disk* below).

Array initialization

A redundant array (RAID 5, RAID 1, RAID 10, RAID 50) needs to be initialized to ensure full performance and reliability. Non-redundant arrays (RAID 0, JBOD) do not need to be initialized.

When you create a redundant array using the RocketRAID 2322 controller's BIOS Configuration Utility, it will create the array in un-initialized state. The initialization process can be completed after installing the driver and management software.

When creating an array using the HighPoint RAID Management Console software, you can specify an initialization option (Skip initialization, foreground and background).

Foreground initialization

Foreground initialization will zero-out all data on the array. The array is not accessible by the operating system until initialization is complete.

Background initialization

Background initialization allows the array to be used immediately. For RAID 1 and RAID 10 arrays, initialization will results in data being duplicated identically to the mirror pair. For RAID 5 and RAID 50 arrays, initialization will result in parity being generated from all array members.

Note: An un-initialized RAID 1 or RAID 10 array can still provide redundancy in case of a disk failure. A RAID 5 or RAID 50 array, however, is not fault-tolerant until initialization is finished.

Online Capacity Expansion (OCE)

This feature allows disks to be added to existing RAID arrays, in order to increase the array's capacity, without fear of data loss. Any number of disks can be added to an array, at any time. Data can be accessed and utilized even while being redistributed.

Online RAID Level Migration

This term describes the ability to change one type of array (RAID level), into a different type of array (changing a RAID 1 array into a RAID 10 array for example). Data is still accessible during the migration process, and a base level of security is still active.

OCE, ORLM and the RocketRAID 2322

The RocketRAID 2322 supports both Online Capacity Expansion (OCE), and Online RAID Level Migration (ORLM). Both features are supported by a single function - an array can be transformed from one RAID level to another RAID level while simultaneously being resized, even under I/O load.

Spare disk

A spare disk is a single disk that can be used to automatically rebuild a redundant array in case of drive failure. Spare disks may also be members of a RAID array. Any available space on these disks may be used to rebuild other broken arrays.

Legacy disk

Disks attached to the RocketRAID 2322 that contain valid partition tables will be identified as legacy disks. A legacy disk attached to the RocketRAID 2322 can be accessed by the operating system, but cannot be used to create RAID arrays. A legacy disk must be initialized before assigning it to an array.

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4 - Verifying Installation
5 - Single-RAID Cross Adapter

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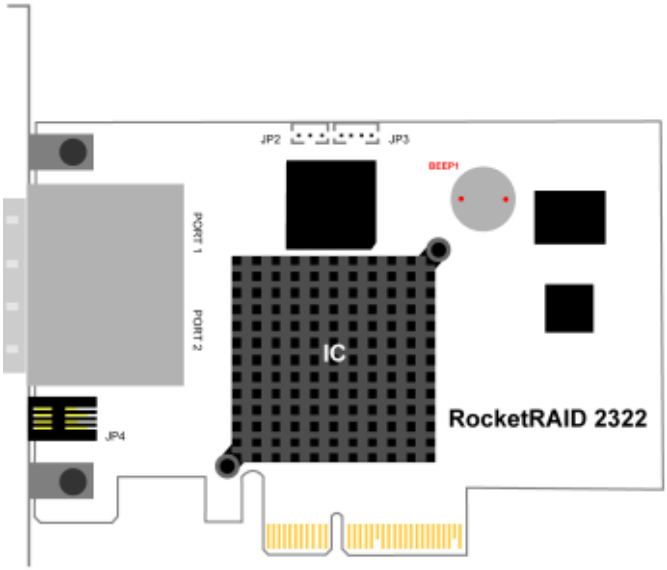
RocketRAID 2322 Hardware

1 - RocketRAID 2322 Adapter Layout



Port1- Port2

These represent the RocketRAID 2322's two external Mini-SAS ports. Each Mini-SAS port hosts up to 4 SATA or SATAII hard disks.

BEEP1 - Speaker

Alarm (speaker): the speaker emits and audible alarm in the case of disk/array failure.

J2, J3 - Cross Adapter Ports

These jumpers enable cross-adapter (multi-card) RAID support. The RocketRAID 2322 includes a cable designed for use with these jumpers. Consult the Single-RAID Cross Adapter section (page 2-3) for more information.

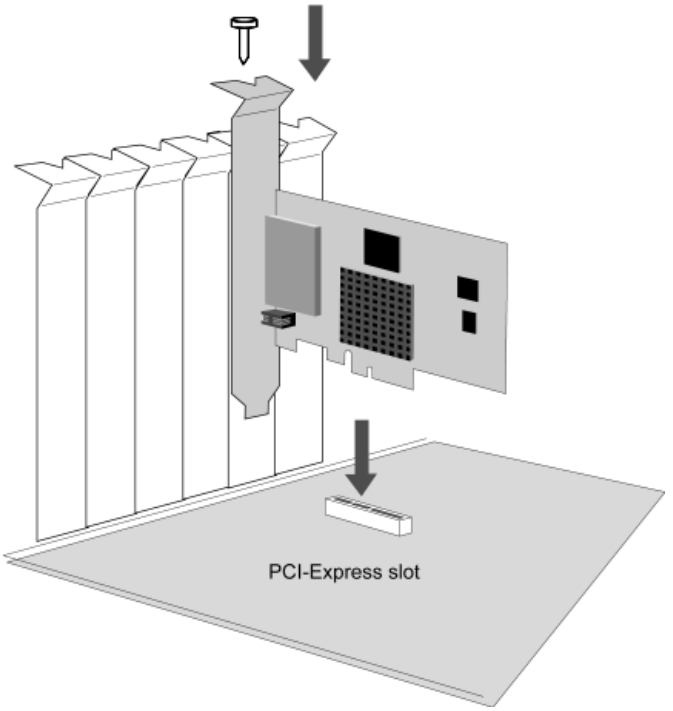
JP4 - RJ11 Port

Designed for use with the X4 and X8 external hard disk enclosures – enables the RAID Management Console (see page 4-2) to monitor and manage various chassis functions/attributes (temperature, hard disk status, etc.)

2 - Installing the RocketRAID 2322 Host Adapter

Note: Make sure the system is powered-off before installing the RocketRAID 2322 host adapter.

1. Open the system chassis and locate an unused PCI-Express slot.
2. Remove the PCI slot cover.
3. Gently insert the RocketRAID 2322 into the PCI-Express slot, and secure the bracket to the system chassis.



4. After installing the adapter, attach hard disks to the RocketRAID 2322 using the Mini-SAS data cables. SATA cables have universal connections – either end can be attached to the adapter or hard disk. Each RocketRAID 2322 included two Mini-SAS cables, and supports up to eight separate hard disks drives (4 disks per cable).

5. Many server-level chassis include hard-disk hot-swap bays. For these system chassis, cables are attached to the chassis backplane, rather than directly to each individual hard disk. Consult the chassis's manual for proper installation procedures.
6. Close and secure the system chassis.

3 - Verifying Installation

Once the RocketRAID 2322 host adapter and hard disks have been installed into the chassis, boot-up the system to verify that the hardware is properly recognized.

1. Power on the system. If the system detects the presence of the adapter, the RocketRAID 2322 BIOS Utility will be displayed during bootup.
2. Press **Ctrl+H** to access the RocketRAID 2322 BIOS Utility.

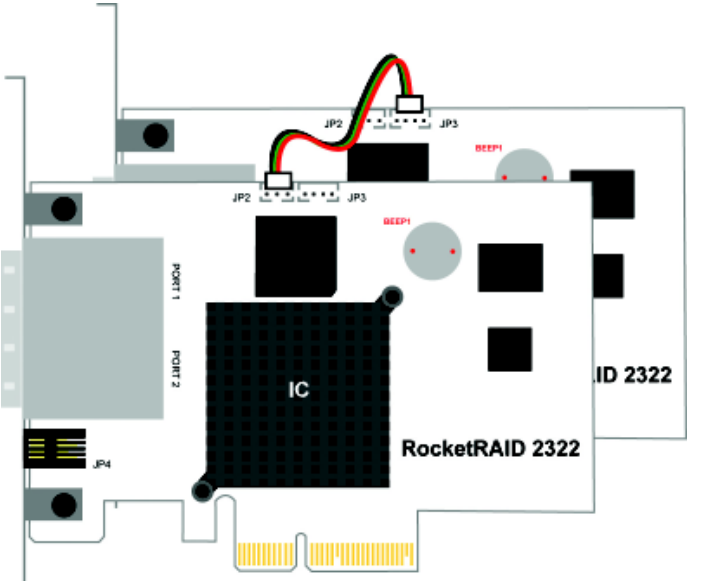
The BIOS Utility will display information about hard disks attached to the adapter. Make sure all attached disks are detected by this utility. If any of the hard disks are not detected, power down the system and check the power and Mini-SAS cable connections.

4 - Single-RAID Cross Adapter

The RocketRAID 2322 is capable of supporting RAID arrays created between hard disks attached to multiple host adapters. Up to sixteen hard disks can be assigned to a single RAID array, and these disks can be attached to as many as four separate RocketRAID 2322 host adapters. This feature is referred to as "Single-RAID Cross Adapter" support.

Each RocketRAID 2322 provides two jumpers dedicated to this feature (JP2 and JP3), and a single cross-adapter cable designed for use with these jumpers. JP2 is a 3-pin jumper, while JP3 is a 4-pin design.

Each cross-adapter cable has a 3-pin and 4-pin connector, designed for insertion into JP2 and JP3 respectively.


JP2
JP3
BEEP1
JP2
JP3
BEEP1
PORT 1
PORT 2
IC
JP4
RocketRAID 2322
ID 2322

Chapter 3
RocketRAID 2322 BIOS Utility

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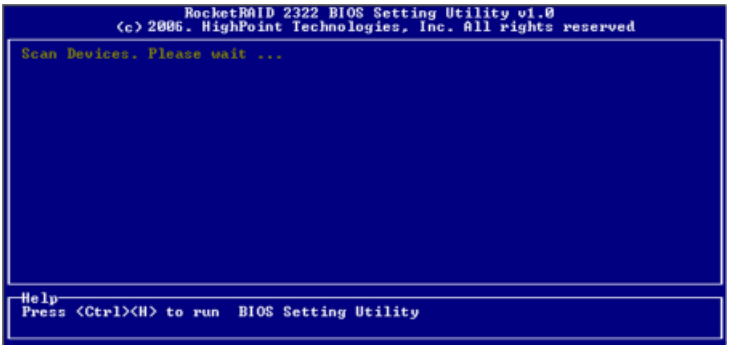
RocketRAID 2322 BIOS Utility

The RocketRAID 2322's BIOS Utility can be accessed using the "Ctrl+H" command.

This command should be displayed automatically when the RocketRAID 2322's BIOS screen appears during the system's boot up procedure.

1 - BIOS Command Overview

The RocketRAID 2322 BIOS Utility provides a wide selection of RAID related commands. These commands are displayed towards the top of the utility's interface.


RocketRAID 2322 BIOS Setting Utility v1.0
(c) 2006. HighPoint Technologies, Inc. All rights reserved
Scan Devices. Please wait ...
Help
Press <Ctrl><H> to run BIOS Setting Utility

Use the ← → arrow keys to scroll through the various commands, and the ↑ ↓ arrows to browse through the corresponding command menus. Use the ENTER key to execute the selected command.

The ESC button can be used to cancel the selected command, or return to the previous command menu.

Create - this command is used to create RAID arrays. Section 2 discusses this command in detail.

Delete - this command will delete the selected RAID array.

Warning: *This command may result in permanent data loss - it should only be used if data stored on the target array is no longer relevant, or has been backed up to an alternate storage device.*

Add/Remove Spare - this command is used to assign hard disks to function as spare disks. The controller is capable of using spare disks to automatically rebuild broken or faulted RAID arrays.

Section 3 discusses this command in detail.

Settings

Set Boot Mark - this function is used to designate a particular disk or RAID array to function as the RocketRAID 2322's boot device.

Note: This setting is only relevant if the motherboard's BIOS has set the RocketRAID 2322 to function as the system's primary boot device.

Staggered drive spin up - this function is used to enable (or disable) staggered drive spin up support This setting, by default, is disabled. Enabling staggered drive spin up will power up the hard disks one at a time, approximately every two seconds.

View - this command is used to select between two views. Press the ENTER key to change the view.

Devices - displays information about hard disks attached to the RocketRAID 2322. Use the ↑ ↓ arrow keys to highlight the target hard disk, and press ENTER to view the information.

RAID Arrays - displays information about RAID arrays attached to the RocketRAID 2322. Use the ↑ ↓ arrow keys to highlight the target array, and press ENTER to view the information.

Initialize - this function is used to prepare disks for use with RAID arrays.

Note: Arrays cannot be created between disks that have not been initialized.

The following section discusses this command in detail.

2 - Creating RAID Arrays

Initializing Disks:

Before creating a RAID array, the disks must be initialized.

Initialization writes necessary RAID configuration information to the hard disk.

Use the ← → arrow keys to select the **Initialize** command, and press ENTER.

Warning: *Initialization will destroy all pre- existing data on the selected hard disks*.

Use the ↑ ↓ arrow keys to highlight the target hard disk(s) and press ENTER. Next, press the **Y** (yes) key to initialize the selected disk(s), or **N** (no) key to cancel the initialization process.

Once initialized, these disks can be utilized to create RAID arrays.

To create an array:

1. Use the ← → arrow keys to highlight the **Create** command, and press ENTER to open the Create Menu.
2. Use the ↑ ↓ arrow keys to select the appropriate RAID level, then press ENTER.
3. Next, use the ↓ arrow key to highlight the **Array Name** option and press ENTER. The array name dialogue box will appear. Use the keyboard to input a new Array Name, and press the Enter key.

   Note: the Array Name command is optional – it is not necessary to name the array. The array can be named at a later time, and the name of the array can be changed at any time.

4. On the Create menu, use the ↓ arrow key to highlight the **Select Devices** item and press ENTER. A device list will appear, and display all available hard disk drives.
5. Highlight the target disks that you want to use, and press ENTER to select them. After all of the disks have been selected, press the ESC key to return to the Create Menu.

6. Next, Use the ↓ arrow key to highlight the **Capacity (GB)** option and press ENTER. The total available capacity will be displayed. Press ENTER if you wish to use all available space.
7. If you wish to reserve disk space for additional arrays/single disks, use the keyboard to input the amount of space (in GB) you wish to set aside for this particular array, and press ENTER.

   Note: Multiple arrays can be created using the same set of hard disk drives. The Capacity option allows you to set aside disk space that can be used to create another array, set as a spare disk, or partitioned to act as a single disk (by the operating system).

8. To complete the creation procedure, use the ↓ arrow key to highlight the **Start Creation** item and press ENTER. Press the **Y** (yes) key to create the array, or **N** (no) key to cancel the creation process.

Single RAID - Cross Adapter

The term "Single RAID - Cross Adapter" refers to the RocketRAID 2322's ability to create RAID arrays between drives attached to multiple RocketRAID 2322 Adapters. Each RAID array can support up to 16 hard disks, and these disks can be attached to as many as 4 separate RocketRAID 2322 adapters.

Cross-Adapter arrays are created in the same manner as standard arrays. The BIOS utility menu will display disks attached to each RocketRAID 2322 adapter installed into the system. Use the Page Up and Page Down keys to scroll through available hard disks.

3 - Adding/Remove Spare Disks

This command is used to assign a hard disk to act as a Spare Disk.

Spare Disks are used to automatically rebuild Redundant RAID arrays (RAID 1, 5, 10, 50) in the case of disk failure. To set a hard disk to act as a Spare Disk, use the ↑ ↓ arrow keys to select a disk, and press ENTER. To remove the Spare Disk setting from a hard disk, highlight the spare disk, and press ENTER.

Generally, single disks are designated to act as spares (disks that are not configured into RAID arrays).

However, in some instances, disks that are members of RAID arrays may also be designated to act as a spare. If the disks in question are part of a RAID array that did not utilize the full available capacity at the time of creation, these disks may be used as spares.

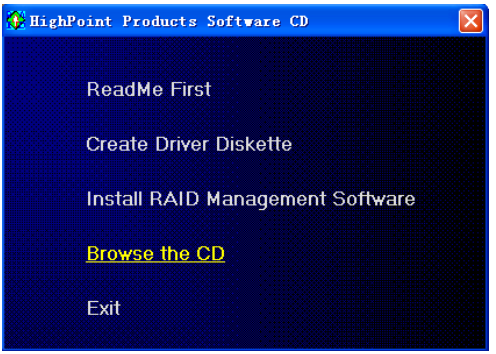
For example: a RAID 0 array was created between two 200GB hard disks, but only 200GB of space (out of a grand total of 400GB), was assigned to that array. In this example, 200GB of disk space remains unallocated. This unallocated space would allow these disks to be set as spares for a separate redundant array that falls into the same capacity range (200GB).

4 - Updating the BIOS

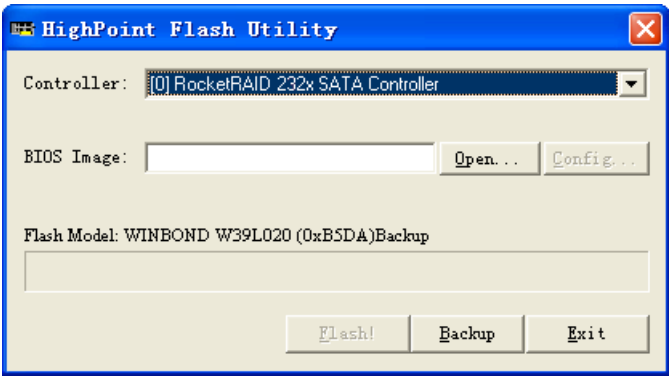
BIOS updates are released periodically, and posted on our website for download. There are several ways to flash the RocketRAID 2322 BIOS.

For Windows based operating systems:

1) Download the desired BIOS update from the Support section provided for the RocketRAID 2322 host adapter. Extract the download to the directory of your choice.
2) Insert the Driver and Software CD included with the RocketRAID 2322 retail box into the system's CD-ROM or DVD drive.
3) The CD should autorun, and display the following screen:



4) Select the "Browse the CD" option, and access the directory provided for the RocketRAID 2322 host adapter.
5) Open the "BIOS" directory, and double click the "hptflash.exe" icon. This will start the BIOS flash utility:



6) Select the RocketRAID 2322 from the drop down menu labeled "Controller", and press the "Open" button – this will allow you to browse to the extracted BIOS download (step 1).
7) Highlight the image file, and click the "Flash!" button. The utility will update the card, then verify the update.
8) Once complete, click on the "Exit" button to close the utility. Shutdown and reboot the system.

Note: the "Backup" button will save a copy of the card's current BIOS to the directory of your choice.

For other operating systems:

In order to update the BIOS, the system must be booted into DOS mode, using a DOS-boot diskette or CD image.

1) Copy the load.exe and the BIOS image file to the bootable floppy diskette (you may need to use a different floppy depending upon how much space is available on the boot diskette - this can vary).
2) If you are booting from a CD image, you will need to add these files to the CD.
   Insert the boot image media into the appropriate drive, and boot the system.

3) Once the A:\> prompt has appeared, insert the media that contains the required BIOS files, and type the following command:
loadxxx.xxx
Then, press enter.
Note: xxx.xxx = the name of the BIOS image file (type it exactly as it appears).

4) The utility will scan for the controller, and ask if you want to backup the BIOS (save a copy of the current BIOS to a floppy diskette). This is optional - you can answer No, and continue.

Note: This option will not function if the system was booted from CD.

5) The utility will then ask if you want to flash the controller (upgrade the BIOS). Select Y for yes.
6) The utility will display a progress bar during the flash procedure, then will attempt verify the update.
7) Once complete, the system can be rebooted.

Chapter 4

RocketRAID 2322 Driver and Software Installation Microsoft Windows (2000, XP, 2003 Server, x64 versions)

Contents of this Chapter:

Driver and Software CD

Windows Driver Installation

Driver and Software CD

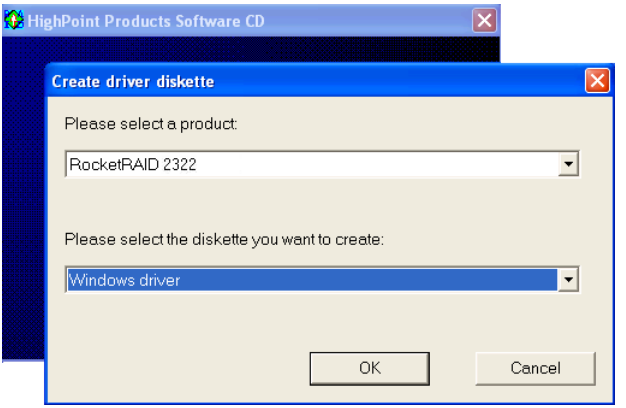
The RocketRAID 2322 retail box includes a Driver and Software CD.

This CD can be used to generate driver diskettes, and install the RAID Management software for a variety of operating systems.

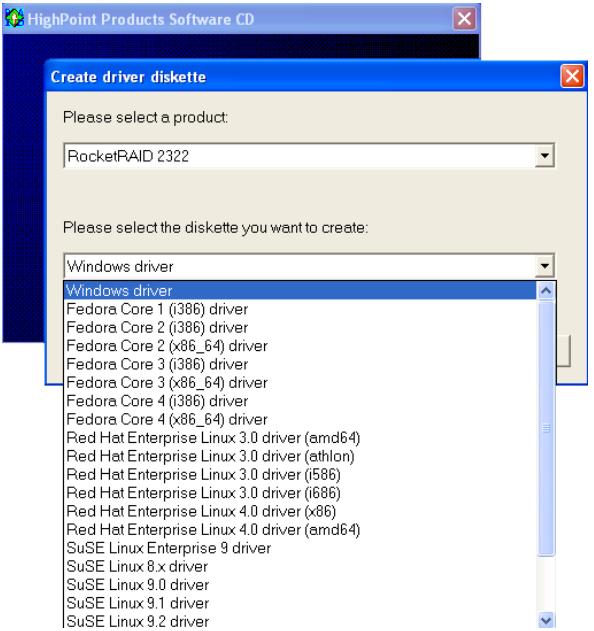
To create a driver diskette:

1. Insert the CD into the system's CD/DVD drive. The program should start automatically.
2. Insert a blank floppy diskette into the system's floppy drive.
3. Click on "Create Driver Diskette".

4. Click on the "Please Select a Product" drop-down button, and select 'RocketRAID 2322" from the list.



5. Click on the "Please Select the Diskette you want to create" drop-down button, and select the appropriate OS from the list.


HighPoint Products Software CD
Create driver diskette
Please select a product:
RocketRAID 2322
Please select the diskette you want to create:
Windows driver
Windows driver
Fedora Core 1 (i386) driver
Fedora Core 2 (i386) driver
Fedora Core 2 (x86_64) driver
Fedora Core 3 (i386) driver
Fedora Core 3 (x86_64) driver
Fedora Core 4 (i386) driver
Fedora Core 4 (x86_64) driver
Red Hat Enterprise Linux 3.0 driver (amd64)
Red Hat Enterprise Linux 3.0 driver (athlon)
Red Hat Enterprise Linux 3.0 driver (i586)
Red Hat Enterprise Linux 3.0 driver (i686)
Red Hat Enterprise Linux 4.0 driver (x86)
Red Hat Enterprise Linux 4.0 driver (amd64)
SuSE Linux Enterprise 9 driver
SuSE Linux 8.x driver
SuSE Linux 9.0 driver
SuSE Linux 9.1 driver
SuSE Linux 9.2 driver

6. Click on the "OK" button to create the driver diskette.

To install the RAID software:

1. Click on "Install RAID Management Software".

2. Select the desired software from the drop down menu, and click on the "OK" button.

Windows Driver Installation

Before installing the RocketRAID 2322 device driver, make sure the RocketRAID 2322 host adapter and all required hard disks have been installed into the system's chassis (refer to the Hardware Installation section, page 2-2).

Installing the RocketRAID 2322 driver for an existing Windows XP/ 2003/x64 system

After the operating system has booted, Windows will automatically detect the RocketRAID 2322, and request that a device driver be installed. To install the device driver, follow the steps outlined below:

1. When the "Found New Hardware Wizard" window appears, select "Install from a list or specific location (Advanced)", and click Next to continue.
2. Click on the "Include this location in the search" option, and select the system's floppy drive (generally Disk A). Next, insert the Driver Installation diskette into the system's floppy drive.
3. At the Hardware Wizard screen, select the floppy drive as the source, then, click the Next button. Select the appropriate operating system folder, and click the Next button.
4. Windows will display a warning message that states the driver has "not been signed". Select "Continue Anyway", and click Finish when prompted. When Windows asks to reboot the system, choose No.
5. Windows will then display a second "Found New Hardware Wizard" window – repeat steps 1 through 4.
6. Remove the Driver Installation diskette from the floppy drive, then Shut down and restart the computer.

Installation Verification

After the driver has been installed, and the system has been restarted:

1. Click the Start button, then right-click My Computer icon. Select the Properties item from the popup menu.
2. In the popup window, select Hardware tab and then click Device Manager button.

3. Double click the "SCSI and RAID controllers" entry. If the RocketRAID 2322 device entry is not displayed, or there are "?" or "!" marks displayed near the RocketRAID 2322 entry, the driver has not been installed properly. Delete the entries and reinstall the driver.

Installing the RocketRAID 2322 driver during a fresh Windows 2000/ XP/2003/x64 installation

1. After booting from the Windows 2000/XP/2003 CD-ROM, when the Windows Setup blue screen appears, look towards the bottom of the screen. Windows will prompt you to press the F6 key if you want to install a third party SCSI or RAID driver. Press the F6 key at this time.
2. The setup procedure will continue, and will later instruct you to press the "S" key to specify additional adapters. Press the "S" key as instructed.
3. Next, the setup program will prompt for the insertion of the driver diskette. Please insert the driver diskette, and then press ENTER to continue.
4. The next window will display several driver options. Please select the RocketRAID 2322 Controller for the corresponding operating system, and press ENTER to continue.

1 - Installing the RAID Management Console/ Interface Overview

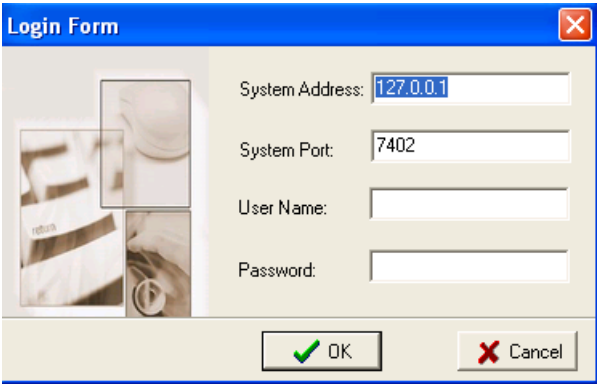
To install the RAID software, locate the setup.exe file located on the floppy diskette labeled "DISK 1" (or the Disk1 folder, if the software was downloaded). Double click this file to start the Installation Wizard.

Note: If the system chassis supports SAF-TE, make sure to select the corresponding chassis-type/manufacturer when prompted.

There is no need to restart the system after installing the software. To start the software, click on the "Start" button, select "Programs", and click on the "HPT Management Console."

Logging On

The RAID Management Console requires that a user (or Administrator) log on. The software is incapable of working with RAID arrays or hard disks attached to the RocketRAID 2322 until the user has logged on.



Default Parameters:

System Address: 127.0.0.1

Port: 7402

User Name: RAID

Password: hpt

Note: The password and user name fields are case sensitive.

The first time the software is used, make sure to enter the information listed above.

After successfully logging on, the software will ask you to alter the password (as a security precaution).

Enter a password, and press enter.

2 - Software Interface - Overview of commands/functions

After logging on, several new options will become available.

These commands are displayed towards the top of the interface window:

Overview of Function-menus (tabs)

File

Remote Control - view information about remote systems

System Configuration - switch between available remote systems

User Management - add or remove users, edit user profiles

Password - change the password

Exit - exit the utility interface

Management

RAID Management - create/delete/maintain RAID arrays

Device Management - check information or change settings for host adapters, and hard disks

Spare management - create and assign spare disks

System Notification - set up system notification options

View

Event view - views the event log

Icon view - view icon descriptions (legend)

Operation

This menu will list all available commands for the selected Function menu.

These commands are also represented in icon/button form (below the function-menu/ tabs selections)

Help

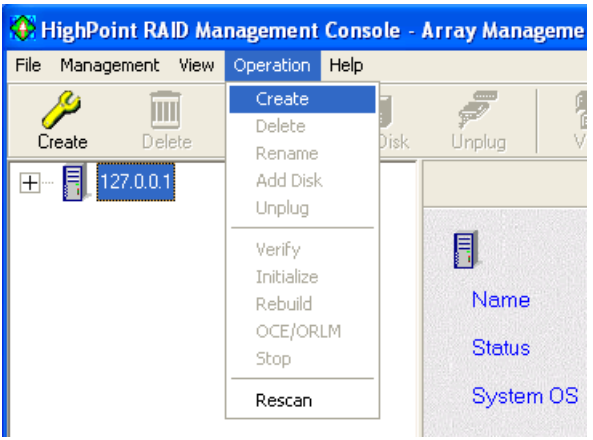
Search through help topics related to the RAID Management Console software

View software version information

3 - Creating an Array

To create an array:

1. Highlight the "Management" menu, then select the "Array Management" function.
2. Click the Create button on the toolbar or select the "Create" command from the "Operation" menu. The array creation wizard will appear.



3. Select the desired RAID level from the drop-down list.
4. Enter a name for the array using the keyboard (this is optional), and click the Next button.
5. If you are creating a redundant array (RAID 1, 5, 10, 50), select an initialization option. If you are creating a RAID 0 or JBOD (volume), skip to step 6:

   For RAID 1 and RAID 10 arrays, the default initialization method is ***"No initialization"***.

   For RAID 5 or RAID 50 arrays, the default initialization method is ***"Foreground"***.

   If you are creating RAID 5 or RAID 50 arrays, you will be asked to specify a cache policy:

Write-back - when the write-back setting is selected, all write requests sent to the array are cached. This will result in higher performance, but data loss may occur in case of a power failure.

Write-through - when the write-through setting is selected, all write requests sent to the array are passed directly to the disks. However, subsequent reads may still be completed from the cache if appropriate.

6. **Select which disks are to be used to create the array**. Highlight the desired disk from the left-side of the interface (available disks), then click on the button to move the disk to the right side of the interface (selected disks). Disks must be selected one a time.

   If you wish to remove a selected disk, highlight it from the selected disk section, and use the button to move it to the available disk section.

   Note: The selection sequence is important - the order in which the disks are selected will determine the disk sequence of the array.

7. **Select the capacity** - the RocketRAID 2322 can create arrays between partitions on various disks. It is not limited to physical hard disk drives. As a result of this feature, you have the option of assigning a physical disk to multiple RAID arrays.

   Press Enter to use the default value (the maximum capacity for the array), or specify the desired value using the keyboard, and press Enter to confirm this selection. Then, click the Finish button.

Note: If you have specified an initialization option, the initialization process will start automatically. A progress bar will be displayed towards the bottom of the interface window, and will indicate % completion, and provide an estimate of the time needed to complete the initialization procedure.

Single RAID - Cross Adapter

The term “Single RAID - Cross Adapter” refers to the RocketRAID 2322 ability to create RAID arrays between drives attached to multiple RocketRAID 2322 Adapters.

Each RAID array can support up to 16 hard disks, and these disks can be attached to as many as 4 separate RocketRAID 2322 adapters.

Cross-Adapter arrays are created in the same manner as standard arrays. The Creation menu will display disks attached to each RocketRAID 2322 adapter installed into the system.

4 - Deleting an Array

To delete an array:

1. Highlight the "Management" menu and select the "Array Management" function.
2. Highlight the array you want to delete, then click on the "Delete Icon" or select the Delete command from the "Operation" menu.
3. A warning message will appear. Click Yes to delete the array. Click on cancel to stop this procedure.

Note: An array in use by the operating system cannot be deleted. Any data stored on a deleted array will be inaccessible

5 - Configuring Spare Disks

Spare disks can be used to rebuild redundant RAID arrays in the case of failure.

To configure spare disks, highlight the "Management" menu, and select the "Spare Management" function. The Spare Management window will appear.

To add a spare disk, select it from the Available Disk list box and click the button to add the disk to the Spare Pool list box.

To remove a spare disk, select it from the Spare Pool list box and click the button to remove the disk from the Spare Pool list box.

6 - Recovering/Verifying Arrays

When an array member (hard disk) of a redundant array fails, the array will be marked as “broken”.

Broken arrays can be automatically rebuilt using hot-spare disks (see page 4-9).

However, if there are no available spare disks, you can still rebuild the array by adding a new disk to it. To add a disk to a broken array:

1. Highlight the “Management” menu, and select the “Array Management” function.
2. Highlight the broken array that needs to be rebuilt.
3. Click the Add Disk button on the toolbar or select “Add Disk” command from the “Operation” menu.
4. If the disk is successfully added to the array, rebuild process will start automatically.

Note: In some instances, a failed array will not rebuild automatically.

To manually start the rebuild process for a broken/critical array:

1. Highlight the “Management” menu, and select the “Array Management” function.
2. Highlight the array that needs to be rebuilt.
3. Click the Rebuild button on the toolbar or select the “Rebuild” command from the “Operation” menu.

Verifying an Array

For a RAID 1 or RAID 10 array, the verify process compares the data of one mirror pair with the other (single hard disk in the case of RAID 1, and a paired set of disks for RAID 10).

For RAID 5 and RAID 50, the verify process calculates RAID parity and compares it to the parity data on the array. Verification checks each sector on a given disk. Periodic verification of an array allows the disk drive firmware to take corrective actions on problem areas on the disk, minimizing the occurrence of uncorrectable read and write errors.

To verify an array:

1. Highlight the "Management" menu, and select the "Array Management" function.
2. Highlight the array you want to verify.
3. Click the Verify button on the toolbar or select the "Verify" command from the "Operation" menu.
4. Verify process will start.

7 - OCE/ORLM

The RocketRAID 2322 supports both OCE (Online Capacity Expansion), and ORLM (Online RAID Level Migration.

The RAID software provides support for these features through a single function, known as **OCE/ORLM.**

With the OCE/ORLM function, you can transform an array from one RAID level to another RAID level and/or resize the array dynamically, even under I/O load.

To perform OCE/ORLM on an array:

1. Highlight the "Management" menu, and select the "Array Management" function.
2. Highlight the array you want to alter.
3. Click the

button on the toolbar or select "OCE/ORLM" command from the "Operation" menu.
4. The OCE/ORLM window will appear.
5. The interface is very similar to the Array Creation Wizard interface. Select the type of array you wish to change the existing array into, then set any corresponding parameters (cache/ initialization options, capacity, if relevant).

Notes:

1. When expanding a JBOD array, all the original disks must be included in the target array, and these disks must be selected in the same order (as the original array). If you want to migrate a JBOD array to another RAID level,

only the first member disk can be included in the target array. For example, a JBOD comprised of 3 disks (1, 2, 3), can only be "migrated" using disk 1. Disks 2 and 3 cannot be used – disk 1 would have to be combined with other disks attached to the RocketRAID 2322 (4, 5, 6, 7, 8).

2. You cannot change an array to another type of array with a smaller capacity. In some cases, a disk may need to be added to the RocketRAID 2322.
3. During the OCE/ORLM procedure, the redundancy level of the array will be the lowest of the source and target arrays; e.g. if you ORLM a RAID0 array to a RAID1 array, the array will be non-redundant until the procedure is complete.
4. The OCE/ORLM process can be aborted and continued at later time. However, you should always stop the transform progress from the RAID Management software.
5. An unexpected system crash may result in data loss while performing OCE/ORLM on an array.

8 - Misc. Array/Device Options

Device Management

The Device Management window provides configuration information about controllers (the RocketRAID 2322 and other HighPoint host adapters), channels and hard disks.

To access the Device Management window, highlight the "Management" menu, and select the "Device Management" function.

Changing Device Settings

Depending upon the hard disk in question, and support provided by the current device driver, you can adjust settings for disk: Read Ahead, Write Cache, TCQ, and NCQ. Each feature can be enabled or disabled individually.

S.M.A.R.T Status

You can view S.M.A.R.T. (Self-Monitoring, Analysis, and Reporting Technology)

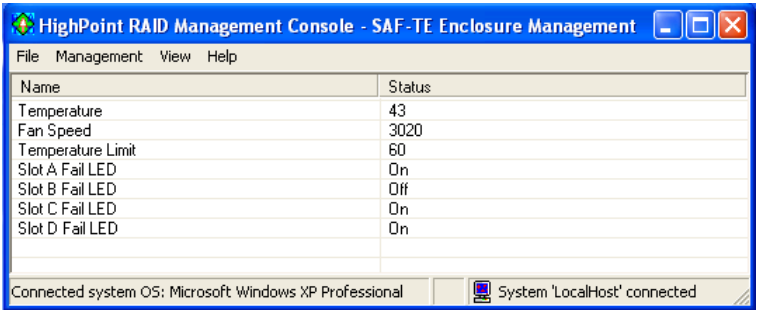
data about a drive to help troubleshoot any problems that occur. You can also setup periodical S.M.A.R.T. status checks that send notification messages when S.M.A.R.T. thresholds are exceeded.

To view the S.M.A.R.T status of a hard disk:

1. Highlight the "Management" menu, and select the " Device Management" function.
2. Highlight the disk you want to examine.
3. Select the "SMART" command from the "Operation" menu, or click on the

button to display the S.M.A.R.T status/settings window.

SAF-TE Management



This feature allows the administrator to view and monitor a variety of SAF-TE related attributes, such as chassis temperature readings, disk failure, and the status of the chassis cooling apparatus (cooling fans).

Note: This feature is dependent upon the system chassis – this function will not be available unless the chassis supports SAF-TE.

Renaming an Array

1. Highlight the "Management" menu, and select the "Array Management" function.
2. Highlight the array you want to rename.
3. Click the Rename button on the toolbar or select the "Rename" command from the "Operation" menu.

4. Enter a new name for the array using the keyboard, and press the OK button to confirm your selection.

Note: An array running background tasks cannot be renamed.

9 - Managing Events

The HighPoint RAID Management Console will log all events that have occurred on any host adapter under it's control.

Viewing Logged Events

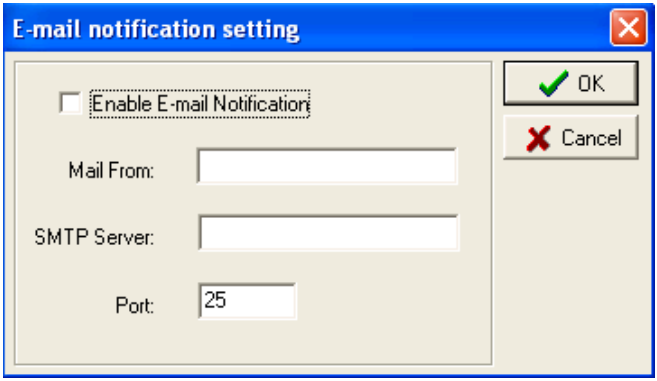
To view logged events:

1. Highlight the "View" menu, and select the "Event View" option.
2. In the Event View window, you can filer events, clear events, and save events to a file.

Configuring E-mail notification

To enable E-mail notification:

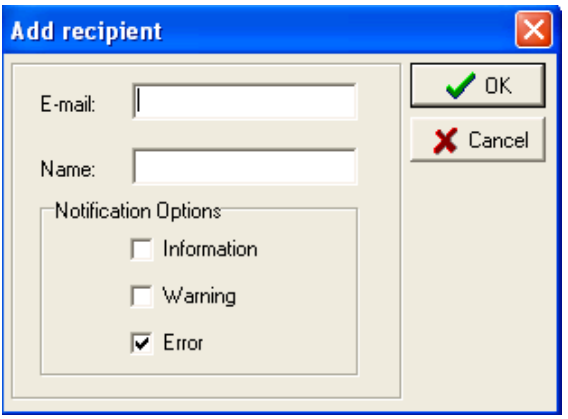
1. Highlight the "Management" menu, and select the "Event Notification" function.
2. Click the Setting button on the toolbar or select "Setting" option from the "Operation" menu.
3. Next, enter the necessary information in the E-mail Notification Setting window.



Note: The software does not support SMTP servers that require user authentication.

To add a Recipient:

1. Highlight the "Management" menu, and select the "Event Notification" function.
2. Click the "Add" button on the toolbar or select "Add" command from the "Operation" menu.
3. Enter the necessary information in the Add recipient window.



4. The recipient will be listed in the main window. You can use Modify or Delete button on the toolbar to modify or delete the recipient.

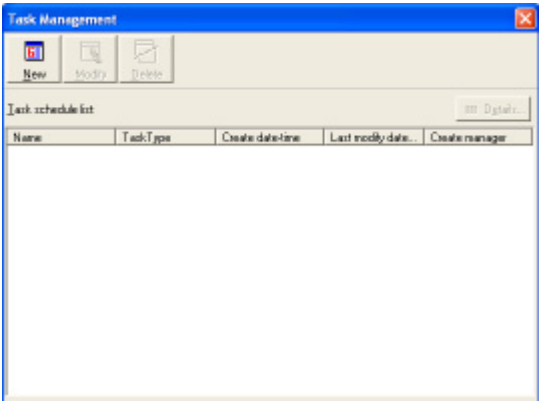
To test E-mail notification:

1. Highlight the "Management" menu, and select the "Event Notification" function.
2. Select one recipient from the main window.
3. Click the Test button on the toolbar or select the "Test" command from the "Operation" menu.
4. The software will send a "test" e-mail message to the selected recipient.

Managing Tasks

The RAID management Console can be used to setup routine, periodical background-rebuild or verification tasks that will help maintain the integrity of RAID arrays attached to the RocketRAID 2322.

To setup and schedule tasks highlight the "Management" menu, and select the "Task Management" function to open Task Management window.

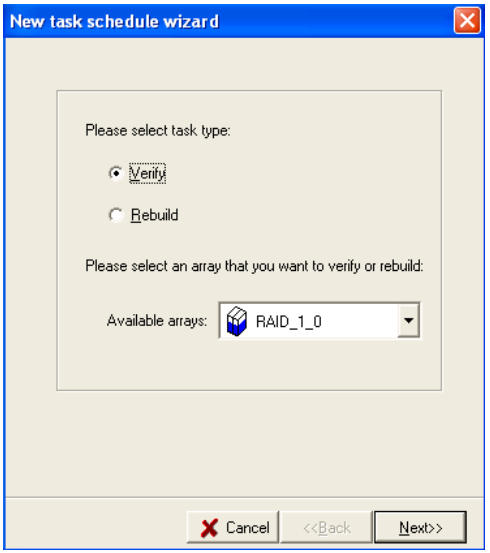


The Task Schedule list displays all of the tasks assigned to the selected remote system. To view detailed information about a specific task, highlight and Double-click the task's name.

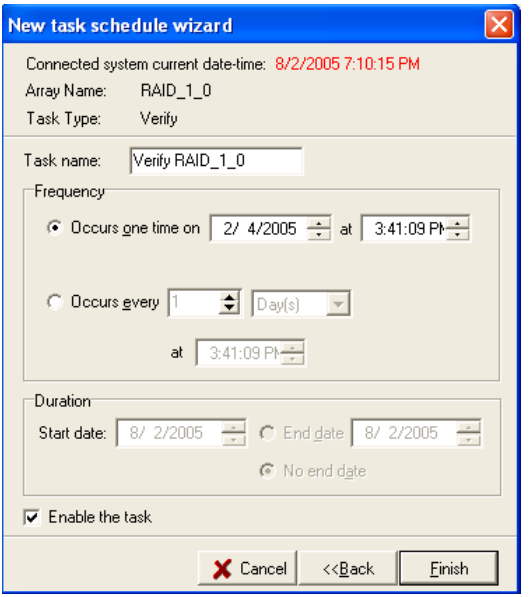
Add a Scheduled Task

This command is used to add a Scheduled task for the selected remote system. To add a new scheduled task:

Click the "New" button on the toolbar. The new task schedule wizard will appear.



Select the task type and the array that you want to verify or rebuild, then click "Next".



1. Enter a name for the task.
2. Configure the frequency for the task.
3. Set the duration for the task.
4. Check the "Enable the task" option to activate this task.
5. Click "Finish".

Modify a Scheduled Task

This command is used to change settings for a scheduled task. To Modify a Task Schedule:

1. Select a task from the Task schedule list.
2. Click the "Modify" button on the toolbar, and modify the task settings in the popup window.

Delete a Scheduled Task

This command is used to delete a Scheduled Task for the selected remote system. To delete a Task Schedule:

1. Select a task from the Task schedule list.
2. Click the “Delete” button on the toolbar.

10 - Configuring Remote Systems

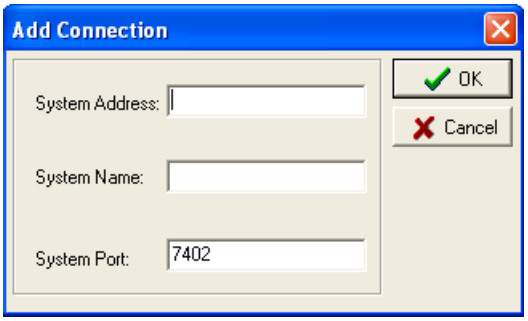
Then HighPoint RAID Management Console manages a RAID controller through a connection to the HighPoint RAID Management Service, which runs on the system where the RAID host adapter is physically installed. This type of system is referred to as a “remote system”.

Note: What the software classifies as a “remote system” may not always be an actual remote computer. In some configurations, the local computer hosts both the RAID host adapter and Management Service. The local system, in these cases, is still generically referred to as a “remote system”.

Add a Connection

This command is used to add new connection to a remote system. To Add a Connection:

1. Highlight the “File” menu, and select the “Remote Control” function.
2. Click the Add button on the toolbar or select the “Add” command from the “Operation” menu.
3. Enter the system address, name, and port information in the popup window.



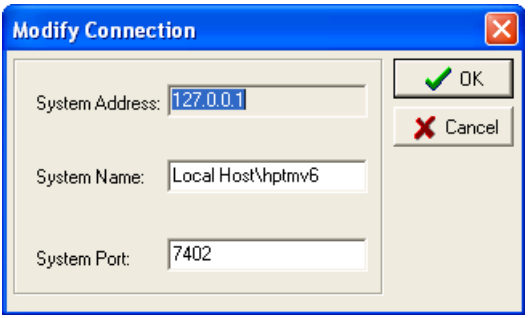
The system address can be a host name, or an IP address. The default system port is 7402.

4. Click “OK” to finish adding the new connection.

Modify a Connection

This command modifies connection information for a remote system. To modify a connection:

1. Highlight the "File" menu and select the "Remote Control" function.
2. Highlight the system you want to modify.
3. Click the Modify button on the toolbar or select the "Modify" command from the "Operation" menu.



4. Enter new connection information in the popup window, and click OK to apply the changes.

Note: The System Address cannot be modified. If you insist on modifying this item, you must first delete this connection and then add a new connection. In addition, the connected system cannot be modified – you must first disconnect from this system.

Delete a Connection

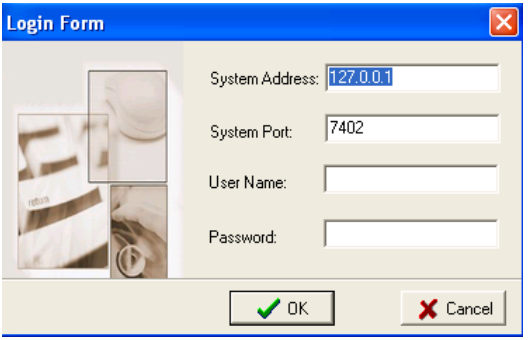
This command deletes a remote system from the connection list. To delete a connection:

1. Highlight the "File" menu and select the "Remote Control" function.
2. Highlight the system you want to delete.
3. Click the "Delete" button on the toolbar or select the "Delete" command from the "Operation" menu.
4. A warning message will be displayed. Click "Yes" to delete the item. Select No to cancel this command.

Connect to a Remote System

This command establishes a connection to a remote system for RAID management. To connect to a remote system:

1. Highlight the “File” menu and select the “Remote Control” function.
2. Highlight the remote system you to establish a connection with.
3. Click the “Connect” button on the toolbar or select the “Connect” command from the “Operation” menu.
4. Enter the appropriate Login information in the popup window.



Note: The initial user name/password for a remote system is RAID/hpt. You are free to modify the username and password after the connection is established.

If the connection is successful established, the application will retrieve the event logs from the remote system, then switch to Array Management view.

Disconnect Remote System

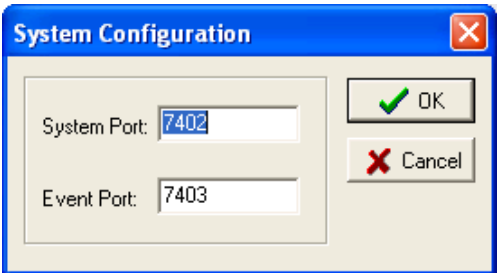
This function closes the connection from a connected system. To disconnect a remote system:

1. Highlight the “File” menu and select the “Remote Control” function.
2. Highlight the system you want to disconnect from.
3. Select the “Disconnect” command from the “Operation” menu.

System Configuration

This function is used to modify the service configuration on a remote system. To change the service configuration:

1. Highlight the "File" menu and select the "Remote Control" function.
2. Highlight the remote system you want to modify.
3. Select the "System Configuration" option from the "Operation" menu.
4. Modify the information in the popup window.



System Port - This is the TCP port number that the RAID Management Service uses to communicate with RAID Management Console. When you connect to the service, the port value you enter must be in accordance with the system port value on the service. The default value is 7402.

Event Port - The client software will retrieve events through this port. The default value is 7403.

The System Port value must differ from the value assigned to the Event Port. After you reset a system's configuration, you should restart the service on that system for the changes to take effect.

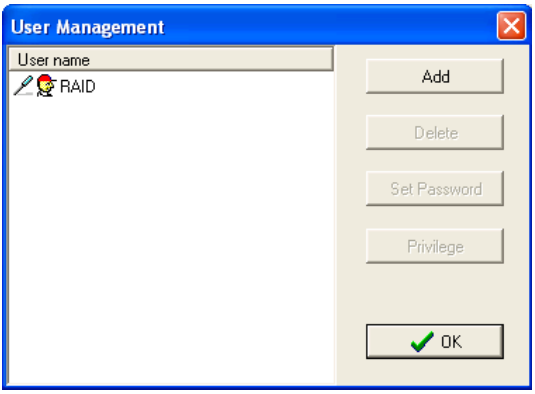
5. Click "OK" to apply the changes.

11 - Configuring Users and Privileges

The RAID Management Console allows the Administrator to manage user accounts in its own database. You can setup multiple users and assign different privileges levels for the purpose of RAID management.

Users can be assigned to each individual Remote System controlled by the RAID Management Console.

Highlight the “File” menu and select the “User Management” function to configure User related options for the selected remote system.

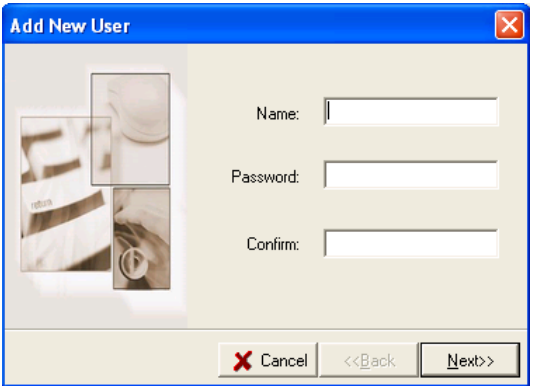


The user management window lists all users assigned to the selected remote system. The current/active user will be designated with an **icon.**

Add a User

This function adds a user account to the connected remote system. To add a user:

1. Click the “Add” button in the User Management window.
2. In the popup window, enter the user name, enter and confirm the password, and then click “Next”.



3. Select the appropriate privileges for the user.
4. Click "Finish".

Delete a User

This function deletes a user's account on the connected remote system. To delete a user:

1. Select the target user ID from the User list displayed in the User Management window.
2. Click Delete to remove the selected user. Click "Yes" to delete the item. Select "No" to cancel this command.

Note: An active user (user currently utilizing the software) cannot be deleted from the console.

Set Password

The Administrator uses this function to set a user's password – the password allows a user to log on to a remote system, and utilize the RAID Management Console. To set password for a user:

1. Select the target user ID from the user list displayed in the User Management window.
2. Click the "Set Password" option, and enter the password for the user.
3. Click OK to apply your selections.

Set Privilege

The Administrator uses this function set a user's privileges for the selected remote system. To set privileges for a user:

1. Select the target user ID from the user list displayed in the User Management window.
2. Click the "Set Privilege" option.

3. In the popup window, assign the privileges for the selected user.
4. Click OK to apply your selections.

Chapter 5

Linux Driver Support

Contents of this Chapter:

Fedora Core 4 Linux installation Overview

Red Hat Enterprise 4 Overview

SuSE Linux Enterprise Server (SLES) installation Overview

Fedora Core 4 Linux installation Overview

This section provides instructions describing how to install and utilize the RocketRAID 2322 Adapter on a Fedora Core 4 Linux system.

1 - Installing Fedora Core 4 on the RocketRAID 2322 Host Adapter

Note: If the OS is running kernel that differs from the one supported by the precompiled driver, the precompiled drivers cannot be used. A driver can be built for this kernel using the Open Source package for the RocketRAID 2322 controller. This package is available from our website, and is posted on the BIOS/Driver page for the RocketRAID 2322.

To install Fedora Linux onto hard disks or RAID arrays attached to RocketRAID 2322 controller, follow the steps outlined below:

Step 1 Prepare the Driver Diskette

The driver is contained in a floppy diskette image file.

On a DOS or Windows system, a Fedora driver diskette can be generated using rawrite.exe. This utility is included on the Fedora Linux CD (under /dosutils). Run rawrite.exe using a command prompt window, and follow the directions it provides.

On a Linux system, use the "dd" command to generate a boot diskette. Insert a floppy disk into the floppy drive and type the following command:

```
# dd if=fc3-i386.img of=/dev/fd0
```

Note: The driver disk image file depends on your core version and hardware.

Step 2 Install Fedora Linux

Installation steps for Fedora Core 4

1) Boot from the Fedora Installation CD, and start the install procedure.
2) At the "Welcome to Fedora Linux" installation screen, a prompt labeled "boot: " will appear at the bottom of the screen. Type in **linux dd**, then press Enter.
   boot: linux dd
3) When prompted "Do you have a driver disk?", select "Yes". At the "Insert your driver disk and press OK to continue" prompt, insert the driver diskette in the floppy drive and then select "OK".
4) The system will now load the RocketRAID 2322 driver automatically.

2 - Installing the RocketRAID 2322 driver for an Existing System

Note: If a SCSI adapter is used to boot the system, make sure the RocketRAID 2322 controller BIOS loads/posts after the SCSI adapter's BIOS. It may be necessary to move the adapter(s) to another PCI slot.

Step 1 Obtain the Driver Module

Extract the module file from the file modules.cgz (from the driver disk) using the following commands:

```
# mount /dev/fd0

# cd /tmp

# gzip -dc /media/floppy/modules.cgz | cpio -idumv
```

Driver modules for all supported kernel versions will be extracted. The driver module for the active kernel is located under the directory that matches the kernel version (/tmp/‘uname –r‘/i686/rr232x.ko).

After extracting the driver module, load it using the following commands:

```
# modprobe sd_mod

# cd /tmp/‘uname –r‘

# insmod rr232x.ko
```

Arrays attached to the adapter can be accessed as SCSI devices (e.g. /dev/sda).

Step 2 Mounting and Partitioning the Device

Example: A RAID array has been configured between several hard disks.

This array will be registered to the system as device "/dev/sda".

To create a partition on this array (which will listed as /dev/sda1), use the "fdisk /dev/sda" command.

Next, use the "mkfs /dev/sda1" command to setup a file system on this partition.

Use the command "mkdir *xxxx*" to create a mount point for the RAID array. Then mount /dev/sda1 /*xxxx* in order to access it.

Note: *xxxx* represents the desired name of the mount point.

Step 3 Configure System to Automatically Load the Driver

To avoid typing in "insmod rr232x.ko" each time the operating system is booted, the system must be instructed to automatically load the module during bootup. To install the module, type in the following commands (first change to the directory where the proper rr232x.ko file is located):

```
# cp rr232x.ko /lib/modules/‘uname –r‘/kernel/drivers/scsi.

# depmod
```

Then, instruct the system to load the module when booting. Use the following commands:

```
# echo "modprobe rr232x" > /etc/init.d/hptdriver

# chmod 755 /etc/init.d/hptdriver

# ln –sf /etc/init.d/hptdriver /etc/rc.d/rc3.d/S01hptdriver

# ln –sf /etc/init.d/hptdriver /etc/rc.d/rc4.d/S01hptdriver

# ln –sf /etc/init.d/hptdriver /etc/rc.d/rc5.d/S01hptdriver
```

Step 4 Configure System to Mount Volumes during Startup

The system can be instructed to automatically mount the array(s) during startup by modifying the file"/etc/fstab".

For example, add the following line to tell the system to mount /dev/sda1 to location /mnt/raid after startup:

```
/dev/sda1      /mnt/raid        ext3    defaults   0 0
```

3 - Updating the Driver

1. If the original driver is installed in the system's initrd (Initial RAM Disk) file (when using a system installed to RR2322 controller, for example), the driver module in the initrd file should be updated using the **mkinitrd** command (or extract the initrd file and replace the driver module manually).
2. If the original driver is installed in the /lib/modules/'uname –r'/kernel/drivers/scsi/ directory, and loaded by the script file (Example /etc/init.d/hptdriver) during the init process, or the configure file (Example /etc/modules.conf), please replace it with the new driver (rr232x.ko).

4 - Uninstalling the Driver

To uninstall the RocketRAID 2322 driver

Note: The driver cannot be uninstalled while the system is booted from a disk or array attached to the RocketRAID 2322.

To uninstall the driver, remove the lines added to /etc/fstab, and remove the files created in the /etc/init.d directory.

Red Hat Enterprise 4 Overview

This section provides instructions describing how to install and utilize the RocketRAID 2322 Adapter on a Red Hat Enterprise 4 Linux system.

1 - Installing Red Hat Enterprise 4 (AS, ES, WS) Linux on the RocketRAID 2322 controller

To install Red Hat Enterprise Linux onto disks or RAID arrays attached to RocketRAID 2322:

Step 1 Prepare the Driver Diskette

The driver is provided in a floppy diskette image file format.

On a DOS or Windows system, a driver diskette can be generated using rawrite.exe. This utility is included on the Red Hat Enterprise Linux CD (under /dosutils). Run rawrite using a command prompt window, and follow the directions it provides.

On a Linux system, use the "dd" command to generate a boot diskette. Insert a floppy disk into the floppy drive and type the following command (amd64 driver for example):

```
# dd if=rh3dd-amd64.img of=/dev/fd0
```

Step 2 Install Red Hat Enterprise Linux

1. Start installing Red Hat Enterprise Linux by booting from the installation CD.
2. At the "Welcome to Red Hat Linux" installation screen, a prompt labeled "boot:" will appear at the bottom of the screen. Type in **linux dd**, then press Enter.
   boot: linux dd
3. When prompted "Do you have a driver disk?". Select "Yes".
4. When prompted "Insert your driver disk and press OK to continue", insert the driver diskette into the system's floppy drive, and select "OK".

5. The system will now load the RocketRAID 2322 driver automatically.
6. When prompted "Where do you want to install the boot loader? " in the "Boot Loader Configuration" dialog, select "Master Boot Record (MBR)" to instruct the system be to boot from the RocketRAID 2322.

Continue the installation as normal. You can refer to Red Hat Enterprise Linux installation guide.

Note:

The system device mapping order is the same as the order shown in RocketRAID 2322 BIOS Setting Utility. If no other SCSI adapters are installed, the device marked as "BOOT" or "HDD0"will identified as */dev/sda*, "HDD1" as */dev/sdb*, "HDD2" as */dev/sdc*, etc. When creating mount points, */boot* must be mounted on */dev/sda*.

2 - Installing the RR2322 driver for an Existing System

Note: If a SCSI adapter is used to boot the system, make sure the RR2322 controller BIOS loads/posts after the SCSI adapter's BIOS. It may be necessary to move the adapter(s) to another PCI slot.

Step 1 Obtain the Driver Module

Extract the module file from the file modules.cgz (from the driver disk) using the following commands:

```
# mount /dev/fd0

# cd /tmp

# gzip -dc /mnt/floppy/modules.cgz | cpio -idumv
```

Driver modules for all supported kernel versions will be extracted. The driver module for the active kernel is located under the directory that matches the kernel version (/tmp/'uname –r'/rr232x.o).

After you have extracted the driver module, you can load it by following commands:

```
# modprobe sd_mod

# cd /tmp/‘uname –r‘

# insmod rr232x.o
```

Arrays attached to the adapter can be accessed as SCSI devices (e.g. /dev/sda).

Step 2 Mounting and Partitioning the Device

Example: A RAID array has been configured between several hard disks.

This array will be registered to the system as device “/dev/sda”.

To create a partition on this array (which will listed as /dev/sda1), use the “fdisk /dev/sda” command.

Next, use the “mkfs /dev/sda1” command to setup a file system on this partition.

Use the command “mkdir *xxxx*” to create a mount point for the RAID array. Then, mount /dev/sda1 /*xxxx* in order to access it.

Note: *xxxx* represents the desired name of the mount point.

Step 3 Configure System to Automatically Load the Driver

To avoid typing in “insmod rr232x.o” each time the operating system is booted, the system must be instructed to automatically load the module during bootup. To install the module, type in the following commands (first change to the directory where the proper rr232x.o file is located):

```
# install -d /lib/modules/‘uname –r‘/kernel/drivers/scsi

# install -c rr232x.o /lib/modules/‘uname –r‘/kernel/drivers/scsi
```

Then, instruct the system to load the module when booting. Use the following commands:

echo “modprobe rr232x” > /etc/init.d/hptdriver

chmod 755 /etc/init.d/hptdriver

ln –sf /etc/init.d/hptdriver /etc/rc.d/rc3.d/S01hptdriver

ln –sf /etc/init.d/hptdriver /etc/rc.d/rc4.d/S01hptdriver

ln –sf /etc/init.d/hptdriver /etc/rc.d/rc5.d/S01hptdriver

Step 4 Configure System to Mount Volumes during Startup

The system can be instructed to automatically mount the array(s) during startup by modifying the file”/etc/fstab”.

For example, add the following line to tell the system to mount /dev/sda1 to location / mnt/raid after startup:

/dev/sda1 /mnt/raid ext2 defaults 0 0

3 - Updating the Driver

If you are not booting from disks attached to RocketRAID 2322 controller, you can update the driver just by reinstalling it following the procedure outlined in the previous section, “Installing the RocketRAID 2322 driver for an Existing System”.

If you are running the system installed to a disk or array attached to the RocketRAID 2322:

First, obtain the new driver module “rr232x.o”. Refer to the previous section “Obtain the Driver Module”. In following steps, we assume it has been copied to “/tmp/rr232x.o”.

Replace rr232x.o in the boot RAM disk image, /boot/initrd-xxx.img (where xxx is the kernel version).

Example: (2.4.21-4.EL for Red Hat Enterprise Linux 3.0):

gzip -dc /boot/initrd-xxx.img > /tmp/initrd.ext2

mkdir /mnt/initrd # mount -o loop /tmp/initrd.ext2 /mnt/initrd

cp /tmp/rr232x.o /mnt/initrd/lib/rr232x.o # umount /mnt/initrd

gzip -c /tmp/initrd.ext2 > /boot/initrd-xxx.img

If you are using lilo to boot the system, use “lilo” to reinstall the RAM disk:

lilo

Update rr232x.o in /lib/modules:

cp /tmp/rr232x.o /lib/modules/‘uname –r‘/kernel/drivers/scsi/rr232x.o

Reboot your system to allow the new driver take effect.

4 - Uninstalling the Driver

To uninstall the RocketRAID 2322 driver

Note: The driver cannot be uninstalled while the system is booted from a disk or array attached to the RocketRAID 2322.

To uninstall the driver, remove the lines added to /etc/fstab, and remove the files created in the /etc/init.d directory.

SuSE Linux Enterprise Server (SLES) installation Overview

This section provides instructions describing how to install and utilize the RocketRAID 2322 Adapter on a SuSE (SLES) Linux system.

1 - Installing SLES Linux on the RocketRAID 2322 Host Adapter

Note: If the OS is running kernel that differs from the one supported by the precompiled driver, the precompiled drivers cannot be used. A driver can be built for this kernel using the Open Source package for the RocketRAID 2322 controller. This package is available from our website, and is posted on the BIOS/Driver page for the RocketRAID 2322.

To install SLES onto hard disks or RAID arrays attached to RocketRAID 2322 controller, follow the steps outlined below:

Step 1 Prepare the Driver Diskette

The driver is contained in a floppy diskette image file (slesdd.img).

On a DOS or Windows system, a driver diskette can be generated using rawrite.exe. This utility is included on the SLES Linux CD (under /dosutils). Run rawrite using a command prompt window, and follow the directions it provides.

On a Linux system, use the "dd" command to generate a boot diskette. Insert a floppy disk into the floppy drive and type the following command:

```
# dd if=SLESdd.img of=/dev/fd0
```

Step 2 Install SLES Linux

1. Start the install procedure by booting from SLES installation CD.
2. After the CD boots, select the "Installation" option and press F6 to load the driver.
3. Insert the Driver Diskette when it displays "Please insert the Driver Update floppy".

4. When the “Diver Update Menu” is displayed, press “OK” and “back” for back to installer.
5. Next. Select “back” to return to the installer.
6. Installation will now proceed normally. Refer to SLES Linux documents for additional OS installation procedures.

Additional Installation Notes:

The system device mapping order is the same as the order shown in RocketRAID 2322 BIOS Setting Utility. If no other SCSI adapters are installed, the device marked as “BOOT” or “HDD0” will be identified as */dev/sda*, “HDD1” as */dev/sdb*, “HDD2” as */dev/sdc*, etc. When creating mount points, */boot* must be mounted on */dev/sda.*

2 - Installing the RocketRAID 2322 Driver on an Existing System

If you are currently running SLES and would like to access drives or arrays attached to the Rocket RAID 2240 controller, follow the steps outlined below:

Note:

If a SCSI adapter is used to boot the system, make sure the RocketRAID 2322 controller BIOS loads/posts after the SCSI adapter’s BIOS. It may be necessary to move the adapter(s) to another PCI slot.

Step 1 Update Grub

If you are running an SLES 9 SMP System, you must first update the /boot/grub/menu.lst.

Example:

```
default=0
timeout=8
title Linux
kernel (hd0,1)/vmlinux root=/dev/hda1 acpi=off
initrd (hd0,1)/initrd
```

Reboot the system to allow the new kernel parameters to take effect.

Step 2 Install the Driver Module

Extract the module file from the file /linux/suse /[arch]-[version]/install/update.tar.gz (from the driver disk), using the following commands:

```
# mount /dev/fd0 /media/floppy

# cd /

# tar xfz /media/floppy/linux/suse/i386-sles9/install/update.tar.gz
```

The driver modules will be extracted to the directory /lib/modules/[kernel-ver]/kernel/drivers/scsi/ .

After you have extracted the driver module, you can load it by following commands:

```
# modprobe sd_mod

# insmod /lib/modules/‘uname –r‘/kernel/drivers/scsi/rr232x.ko
```

Then you can access the arrays attached to the controller as SCSI devices (e.g. /dev/sda).

Step 3 Mounting and Partitioning the Device

Note: Many versions of SuSE include YAST. YAST is a graphical configuration utility that is capable of executing the commands described below. We recommend using YAST, if available, as it may help simplify the installation process.

Example: A RAID array has been configured between several hard disks.

This array will be registered to the system as device “/dev/sda”.

1. To create a partition on this array (which will listed as /dev/sda1), use the “fdisk /dev/sda” command.
2. Next, use the “mkfs /dev/sda1” command to setup a file system on this partition.
3. Use the command “mkdir *xxxx*” to create a mount point for the RAID array. Then, mount /dev/sda1 /*xxxx* in order to access it.

Note: *xxxx* represents the desired name of the mount point.

Step 4 Configure System to Automatically Load the Driver

To avoid typing in "insmod rr232x.o" each time the operating system is booted, the system must be instructed to automatically load the module during bootup. To install the module, type in the following commands (first change to the directory where the proper rr232x.ko file is located):

1. Edit the file "/etc/sysconfig/kernel", and add the rr232x module to the line "INITRD_MODULES=…"

Example:

INITRD_MODULES="reiserfs rr232x"

2. Run the "depmod" command to update the module configuration:

   # depmod

3. Next, run the "mkinitrd" command to update the initrd file:

   # mkinitrd

4. If you are using the lilo boot loader, run lilo again:

   # lilo

Step 5 Configure System to Mount Volumes during Startup

The system can be instructed to automatically mount the array(s) during startup by modifying the file"/etc/fstab".

For example, add the following line to tell the system to mount /dev/sda1 to location /mnt/raid after startup:

```
/dev/sda1      /mnt/raid        ext2    defaults   0 0
```

3 - Updating the Driver

To update the driver, simply reinstall the driver following the steps in previous section, “ Install RocketRAID 2322 Driver on an Existing System ”.

Note: If the driver is loaded in initrd (when system is installed onto a disk or array attached to the RocketRAID 2322), you need to run the mkinitrd command to update the initrd file. If you are using the lilo boot loader, run lilo again (# lilo).

4 - Uninstalling the Driver

To uninstall the RocketRAID 2322 driver

Note: The driver cannot be uninstalled while the system is booted from a disk or array attached to the RocketRAID 2322.

To uninstall the driver, remove the lines added to /etc/modules.conf and /etc/fstab.

Chapter 6
FreeBSD Driver Support

Contents of this Chapter:

1 - Installing FreeBSD on the RocketRAID 2322 Controller
2 - Installing the RocketRAID 2322 Driver on an Existing System
3 - Updating the Driver
4 - Uninstalling the Driver

1 - Installing FreeBSD on the RocketRAID 2322 Controller

If you would like to install FreeBSD onto arrays attached to the RocketRAID 2322 host adapter, please follow the steps below.

Step 1 Prepare the Driver Diskette

When installing FreeBSD to a disk or array attached to the RR2322, you must prepare a RR2322 driver diskette before starting the installation procedure.

First, obtain the driver diskette image file from the driver package.

In a DOS or Windows system, create the boot diskette using the rawrite.exe utility. This utility can be found on the FreeBSD CD (under \tools). Run it under a DOS-Prompt window and follow it's prompt.

On a FreeBSD system, use the "dd" command to make the driver diskette. For example, Insert a floppy disk into the floppy drive and type the following command (if you are installing FreeBSD 5.x versions):

 # dd if=freebsd_5.x.img of=/dev/fd0

Step 2 Install FreeBSD

1. Start the FreeBSD installation procedure by booting from installation CD.
2. If you are installing FreeBSD 5.0 or earlier versions, skip this step. When the "**Welcome to FreeBSD**" screen appears, select "**6**".
3. When the "**Hit [enter] to boot immediately or any other key for command prompt**" screen appears, press the SPACE key to stop the loader from autobooting.

```
BTX loader 1.00  BTX version is 1.01
Console: internal video/keyboard
BIOS driver A: is disk0
BIOS driver B: is disk1
BIOS driver C: is disk2
BIOS 636kB/74512kB available memory
```

```
FreeBSD/i386 bootstrap loader, Revision 0.8
(mailto:jkh@narf.osd.bsdi.com, Sat Apr 21 08:46:19 GMT
2001)
-
Hit [Enter] to boot immediately, or any other key for
command prompt.
Booting [kernel] in 9 seconds…

 <-press SPACE key
```

A prompted label "**ok**" will appear at the bottom of the screen.

4. Insert the RR2322 driver diskette into floppy drive. Type in "**load diskx:rr232x-x.x**" (without quotation marks), and then press **enter**.

```
for FreeBSD 4.3-RELEASE
 ok load kernel
 ok load disk1:rr232x-4.3.ko

for FreeBSD 4.4-RELEASE
  ok load kernel
  ok load disk1:rr232x-4.4.ko

for FreeBSD 4.5-RELEASE
  ok load disk1:rr232x-4.5.ko

for FreeBSD 4.6.2-RELEASE
  ok load disk1:rr232x-4.6.2.ko

for FreeBSD 4.7-RELEASE
  ok load disk1:rr232x-4.7.ko

for FreeBSD 4.8-RELEASE
  ok load disk1:rr232x-4.8.ko

for FreeBSD 4.9-RELEASE
  ok load disk1:rr232x-4.9.ko

for FreeBSD 4.10-RELEASE
  ok load disk1:rr232x-4.10.ko
```

```
for FreeBSD 4.11-RELEASE
  ok load disk1:rr232x-4.11.ko

for FreeBSD 5.0-RELEASE
  ok load disk0:rr232x-5.0.ko

for FreeBSD 5.1-RELEASE
  ok load disk0:rr232x-5.1.ko

for FreeBSD 5.2.1-RELEASE
  ok load disk0:rr232x-5.2.1.ko

for FreeBSD 5.3-RELEASE
  ok load disk0:rr232x-5.3.ko

 for FreeBSD 5.4-RELEASE
  ok load disk0:rr232x-5.4.ko

 for FreeBSD 5.3-AMD64-RELEASE
  ok load disk0:rr232x-5.3-amd64.ko

 for FreeBSD 5.4-AMD64-RELEASE
  ok load disk0:rr232x-5.4-amd64.ko
```

5. After the driver has been loaded, remove the floppy diskette from the floppy drive.
6. Type in “boot” and continue with installation as normal. Refer to FreeBSD installation guide for additional information.

```
ok boot
```

Note: On some systems, when ACPI is enabled, FreeBSD may not function properly. Try disabling ACPI in the motherboard’s BIOS settings, or type the command “**set hint.acpi.0.disabled=”1”**” under the boot prompt, in order to solve the problem.

7. Before exiting installation, an additional step must be taken to copy the RR2322 driver module to the system. On the driver diskette, there is a setup script labeled "**postinstall**", which will complete this task. Before rebooting the system, press **Alt-F4** to enter the command shell, and type the following commands:

```
# mount -o ro /dev/fd0 /mnt

# sh /mnt/postinstall

# umount /mnt
```

   Then, press **Alt-F1** to return to the setup screen, and choose **[X Exit Install]** to finish setup.

2 - Installing RR2322 Driver on an Existing System

If you are currently running FreeBSD and would like to access drives or arrays attached to the RR2322 Controller, follow the steps outlined below:

Step 1 Copy the Driver Module

If you have made FreeBSD drivers into a diskette, you can insert the driver diskette to floppy drive, then using the following commands to copy the driver module:

```
For FreeBSD 4.x:
# mount -o ro /dev/fd0 /mnt
# cp /mnt/rr232x-xxx.ko /modules/rr232x.ko
# umount /mnt

For FreeBSD 5.x:
# mount -o ro /dev/fd0 /mnt
# cp /mnt/rr232x-xxx.ko /boot/kernel/rr232x.ko
# umount /mnt
```

Alternately, it is possible extract the files from the .img files directly, without using a floppy diskette:

```
For FreeBSD 4.x:
# vnconfig vn0c freebsd_xxx.img
# mount /dev/vn0c /mnt
# cp /mnt/rr232x-xxx.ko /modules/rr232x.ko
# vnconfig -du vn0c myfilesystem mount=/mnt

For FreeBSD 5.x:
# mdconfig -a -t vnode -f freebsd_5.x.img -u 0
# mount /dev/md0 /mnt
# cp /mnt/rr232x-xxx.ko /boot/kernel/rr232x.ko
# umount /mnt
# mdconfig -d -u md0
```

Step 2 Test the Driver Module

Test the driver module to ensure that it works with the system, by loading it during bootup. If the module has been loaded successfully you should see the RR2322 banner and a display screen of the attached drives. You can now access the drives as a SCSI device.

Note: If you have no other SCSI device, the first device is /dev/da0, then /dev/da1, etc.).

Example: F1 FreeBSD

```
Default: F1

>> FreeBSD/i386 BOOT
Default: 0:ad(0,a)/boot/loader
boot:

BTX loader 1.00  BTX version is 1.01
Console: internal video/keyboard
BIOS driver A: is disk0
BIOS driver C: is disk2
BIOS 636kB/74512kB available memory

FreeBSD/i386 bootstrap loader, Revision 0.8
(mailto:jkh@narf.osd.bsdi.com, Sat Apr 21 08:46:19 GMT
2001)
Loading /boot/defaults/loader.conf
```

```
/kernel text=0x24f1db data=0x3007ec+0x2062c -
<- For FreeBSD 5.1 and later: select "6" on "Welcome to
FreeBSD" screen.

Hit [Enter] to boot immediately, or any other key for
command prompt.
Booting [kernel] in 9 seconds…

 <-press SPACE key
Type '?' for a list of commands, 'help' for more de
tailed help.
ok load rr232x
/modules/rr232x.ko text=0xf571 data=0x2c8+0x254
ok autoboot
```

Note: If you have configured a RAID 10 using 4 disks, it will be registered to system as device **/dev/da0**. You can use "**/stand/sysinstall**" to create partitions and disklabels (like da0s1e) on **da0**. Then, create a new filesystem using "**newfs /dev/da0s1e**". Now you can mount **/dev/da0s1e** to somewhere to access it.

Step 3 Configure System to Automatically Load the Driver

To avoid typing in "load rr232x" each time the operating system is booted, the system must be instructed to automatically load the module during bootup. To configure the system to automatically install the module, type in the following commands:

```
# echo 'rr232x_load="YES"' >> /boot/defaults/loader.
conf
```

This command will instruct the loader to load the RR2322 module together with the kernel. After using this command, reboot the system. The RR2322 module should now automatically load each time the operating system starts up.

Note: When using FreeBSD 4.x, type in the following command to configure the system:

```
# mknod /dev/rr232x c 200 0
```

Then, check to make sure the node "/dev/rr232x¡±, is present in the /dev directory.

Step 4 Configure the System to Mount Volumes at Startup

Instruct the system to automatically mount the array by modifying the file /etc/fstab.

Example: Add the following line to instruct the system to mount /dev/da1s1e to location /mnt/hpt after startup:

/dev/da1s1e /mnt/hpt ufs rw 0 0

3 - Updating the Driver

To update the driver with a newer revision, simply reinstall the driver following the steps discussed in the previous section, *"Install the driver on an existing system"*.

4 - Uninstalling the Driver

The driver can only be uninstalled when the system is not booting from devices attached to the RR2322 controller. To uninstall, remove the line rr232x_load="YES" located in */boot/defaults/loader.conf*, and then delete the driver module /modules/rr232x.ko or /boot/kernel/rr232x.ko.

Appendix

Customer Support

Customer Support

If you encounter any problems while utilizing the RocketRAID 2322, or have any questions about this or any other HighPoint product, feel free to contact our Customer Support Department.

Troubleshooting Checklist

Before contacting our Customer Support department:

Make sure the latest BIOS, driver and RAID Software have been installed for the RocketRAID 2322. Updates are available from our website.

Prepare a list of the computer system's hardware and software (motherboard, CPU, memory, other PCI devices/host adapters, operating system, applications).

Contact Information

E-mail address: support@highpoint-tech.com

Phone: 408-942-5800 (request for support)

9:00AM-6:00PM, Pacific Standard Time

Additional information about HighPoint products is available from our web site:

http://www.highpoint-tech.com

FCC Part 15 Class B Radio Frequency Interference statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union Compliance Statement

This Information Technologies Equipment has been tested and found to comply

with the following European directives:

- European Standard EN55022 (1998) Class B
- European Standard EN55024 (1998)